

refer to "post color number" in addition to "pc number", and claims 14, 16 and 21 have been amended to refer to "post color number".

Reconsideration is respectfully requested of the rejection of claims 1, 3-8 and 10 through 21 as obvious over the EP 511695 and Lachenal et al references, both of which are fully discussed in the instant application specification, in view of "admitted prior art". The rejection is based upon a number of erroneous factual premises. These include: (1) that there is any "admitted prior art" having any relevance whatsoever to the rejection; (2) that the EP 511695 reference would remove at least 50% of the hexenuronic acid at the pH, time, and temperature conditions set forth in the first example therein; (3) that the use of the temperature range according to the invention would be obvious to speed up "metal ion removal", or "to further reduce the Kappa No.".

With respect to (1), the specification does not in any way, shape or form admit that the recognition that hexenuronic acids are present in pulp is in the prior art. What page 4, lines 13 through 22, of the specification specifically provides is:

"It is known that cellulose pulps contain 4-O-methyl- α -D-glucuronic acid groups (glucuronic acid groups). According to the invention it has been discovered that sulphate pulps also contain, in addition to glucuronic acid groups, a significant amount of 4-deoxy- β -L-threo-hex-4-enopyranosyl uronic acid groups (i.e. hexenuronic acid groups) bound to xylan. The amount of hexenuronic acid in some pulps is even substantially greater than the amount of known glucuronic acid groups. The term "hexenuronic acid" as used in the present specification and claims encompasses all 4-deoxy- β -L-threo-hex-4-enopyranosyl uronic acid groups." (Emphasis added.)

Thus the "admitted prior art" is not "admitted". See also paragraph 5 of the enclosed Vuorinen evidentiary declaration.¹

(2) There is absolutely no basis for assuming that the treatment in Example 1 of EP 511695 ("the '695 reference") -- namely a pH of 2.3, temperature of 60°C, and a time of 30 minutes -- would remove at least 50% of the hexenuronic acid, as specifically called for by independent claims 1, 18 and 20. In fact applicants' evidence indicates it would not. In this regard attention is directed to the enclosed evidentiary declaration of Tapani Vuorinen, Table 3 in Exhibit D (while the entire Vuorinen declaration should be reviewed and is consistent with this, Table 3 is specifically referred to because it is believed it clearly shows the assumption in the previous Action is erroneous). Table 3 illustrates that with a pH of 2 at a temperature of 70°C and a duration of two hours (both the time and the temperature being significantly greater than in the '695 patent example, and the pH being slightly lower, all of which are likely to result in the removal of more hexenuronic acid) the amount of hexenuronic acid removed was about 6.5 meq/kg. From the last line in Table 3 it will be seen that the pulp had at least 40.0 meq/kg of hexenuronic acid, therefore it is clear that treatment pursuant to Example 1 of the '695 reference would result in removal -- at most -- of about 16% of the hexenuronic acid, not at least about 50%.

(3) There is nothing in the art that would suggest increasing the temperature in EP '695 or Lachenal et al so that it is over 85°C (as recited in independent claims

¹The original fax copy, and a more readable copy, of the Vuorinen declaration are both enclosed.

1 and 27) or between about 90-180°C (as recited in claims 18 and 20). Neither of the references teaches that one would get a significant beneficial effect on metal removal or Kappa No. reduction as a result of increasing the temperature past the maximum or preferred range thereof, and one of ordinary skill in the art would not increase the temperature to 85°C or above, or to about 90-180°C, because of a dramatic decrease in viscosity that would result, and is known in the art. In this regard attention is particularly directed to paragraph 4 of the Vuorinen declaration, as well as the test data in Tables 1 and 2 (Exhibits B and C thereof) relating to viscosity. Note the unacceptable decrease in viscosity for treatment at pH 2 in Table 1, and 1.5 in Table 2, which clearly support the analysis provided in paragraphs 8 and 9 of the Vuorinen declaration that the treatment described by Lachenal et al at 90°C is impractical. Nor do either of the references teach the kappa number reduction as recited in claim 1. Lachenal et al disclose that raising the temperature in the acid treatment results in a further decrease of kappa no. after a peroxide stage, but does not teach or suggest that the kappa would decrease in the acid treatment prior to the bleaching stage.

In addition to the rejection in the previous Action being based upon the erroneous factual assumptions (1)-(3) set forth above, there clearly and unequivocally is no *prima facie* case of obviousness, and even if the references are combined the claimed invention does not ensue.

In chemical pulping, the chemical components of wood can be classified into two groups: those which form part of the cell wall and intercellular structure; and extraneous components which are not an essential structural feature of the wood.

The cell wall and intercellular components of wood are of primary interest in pulp manufacture, and are in two main classes, polysaccharides (primarily cellulose and hemicelluloses) and lignin. Hexenuronic acids are associated with hemicellulose xylans, that is a non-lignin component of the wood.

The basic concept of the invention is that by selectively removing hexenuronic acid groups from cellulose pulps in connection with bleaching it is possible to reduce the consumption of bleaching chemicals. The optimized conditions that are provided according to the present invention are solely to achieve this function -- namely hexenuronic acid group removal so as to reduce bleaching chemical consumption. Since the prior art does not even recognize that hexenuronic acids are present in significant quantity in chemical pulp and should be removed there is no suggestion whatsoever to one of ordinary skill in the art to perform the optimization that has been provided according to the present invention. In this regard see In re Antonie, 195 USPQ 6, 8 (CCPA 1977) wherein the Court held:

"In In re Aller, 42 CCPA 824, 220 F.2d 454, 105 USPQ 233 (1975), the court set out the rule that the discovery of an optimum value of a variable in a known process is normally obvious. We have found exceptions to this rule in cases where the results of optimizing a variable, which was known to be result effective, were unexpectedly good. In re Waymouth, 499 F.2d 1273, 182 USPQ 290 (CCPA 1974); In re Saether, supra. This case, in which the parameter optimized was not recognized to be a result-effective variable, is another exception. The decision of the board is reversed."

According to the invention it has also been surprisingly discovered that while the consumption of bleaching chemicals can be significantly reduced by the removal hexenuronic acids the brightness reversion tendency of pulp decreases (typically the pulp has a pc number of less than 2) and bleaching becomes more selective since heavy metals can be removed more efficiently. These surprising

aspects of the invention are also not disclosed in the art and provide no reason why one of ordinary skill in the art would provide the optimized conditions which achieve that result according to the invention. Where the prior art does not recognize the advantages achievable according to the invention there can be no suggestion for a modification or combination of the references to provide the invention. See In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984):

"We are persuaded that the board erred in its conclusion of prima facie obviousness. ... The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification."

The '695 reference suggests that after acid treatment metal ions advantageous for peroxide bleaching, such as magnesium ions, should be added since some of these metals are removed during acid treatment. In the '695 reference the acid treatment is effected at a temperature of 10-95°C, most preferably at 40-80°C, and in Example 1 (referenced in the previous Action) at 60°C; and at a pH of 1-6, most preferably 2-4 (2.3 in Example 1), for a time of 20-40 minutes (30 minutes in Example 1). Since the '695 patent relates significantly to metal ion removal there would be no reason to increase the time to more than 40 minutes. While extra time is not usually very harmful for removal of metals, it naturally causes extra costs to the mill, since long treatment times require use of larger tanks. Large tanks have also been avoided because it has been feared that the acid stage would harm the strength qualities of the pulp. (The decrease in strength qualities where the pH is low is confirmed by the Vuorinen declaration.)

The '695 reference also takes an approach that is contrary to the invention. According to that reference mere acid treatment per se (see page 2, lines 25 through 33 and page 5, lines 22 through 24) is not provided, but rather the addition of magnesium after acid treatment is necessary otherwise the desired viscosity and brightnesses are not obtained (see Table I, page 5). The '695 patent thus neither discloses or suggests a selective removal of hexenuronic acid from cellulose pulp, nor is there any hint as to what combination of pH, time, and temperature is needed to effect such removal.

Lachenal et al disclose a process where the transition metals are removed from pulp with an acid treatment and the pulp is bleached with peroxide. Some experiments (Table 4) have been carried out at a temperature of 20-90°C. The acid concentration has been H₂SO₄ % by weight of the dry pulp, which means that the pH is about 1.5, which is lower than the pH recited in the claims here (see paragraph 2 of the Vuorinen declaration). It has been recommended that the temperature is preferably between 60-80°C, which is, again, lower than that in the claims here. As indicated above, Lachenal et al disclose that raising the temperature in the acid treatment results in a further decrease of kappa no. after a peroxide stage, but does not teach or suggest that the kappa would decrease in the acid treatment prior to the bleaching stage. Corresponding experiments to those in Table 4 of Lachenal et al have been disclosed in Lachenal et al's Canadian patent 1,206,704² (an English language translation of Table 1 is attached), which shows that the kappa number goes from 31 to 30.5. Had Lachenal et al known

²Submitted with the IDS filed January 25, 1996.

that the kappa could be reduced at least two units, they would have used the "correct" conditions of the invention.

Further, Lachenal et al have a teaching specifically contrary to the invention. Lachenal et al treat pulp the kappa number of which is high (30 -- see page 146, left column, first paragraph, line 3), and their object is to remove lignin (not a non-lignin component which is removed according to the invention). They teach that the removal of lignin can be improved by pretreatment which activates the lignin for peroxide treatment. The invention of claims 1, 18, 20 and 27, on the other hand, has removed the majority of the lignin prior to the acid treatment (a kappa number of under 24)³. The invention relates to the removal of a component from the remaining substance, which component is attached to the non-lignin part of the pulp, that is to the hemicellulose xylan. Thus the teachings of Lachenal et al are specifically contrary to the invention, providing treatment of high lignin pulp in order to facilitate removal of the lignin therein.

There is no basis whatsoever on which one of ordinary skill in the art would select the non-preferred temperature range of Lachenal et al for acid treatment, yet ignore the teachings of Lachenal et al that require high lignin pulp in order to achieve Lachenal et al's desired results. Lachenal et al would consider the practice of the invention contrary to their purposes, and it can never be considered obvious to modify a reference in that regard. See Hughes Aircraft Co. v United States, 215

³Claim 27 calls for a kappa number of 25.9 (see page 21, line 12, of the instant application disclosure) or less.

USPQ 787, 804 (Ct. Cl. 1982), relevant portions affirmed 219 USPQ 473 (Fed. Cir. 1983), wherein the Court held:

"Furthermore, it is generally settled that a change in a prior art device which makes the device inoperable for its intended purpose cannot be considered to be an obvious change....In the case at bar, it is clear that if the McLean space vehicle were modified as suggested it would no longer be capable of performing its intended target-seeking function. Thus, the suggested changes are not obvious changes."

Nor would one select from Lachenal et al certain features convenient to a rejection while ignoring those features contrary to the invention but necessary to get Lachenal et al's results (such as high kappa number pulp, and lignin is removed). In this regard see In re Kamm, 172 USPQ 298, 301, 302 (CCPA 1972) wherein the Court held:

"The rejection here runs afoul of a basis mandate inherent in §103 -- that 'a piecemeal reconstruction of the prior art patents in the light of appellants' disclosure' shall not be the basis for a holding of obviousness. In re Rothermel, 47 CCPA 866, 870, 276 F.2d 393, 396, 125 USPQ 328, 331 (1960). 'It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.' ... However, we are satisfied that when the secondary references are viewed in their entirety, with due consideration given to what they fail to disclose and what they disclose as undesirable, it is evident that the proposed modification of the primary reference would not have been obvious to one of ordinary skill in the art at the time the invention was made." (Emphasis added.)

With respect to the dependent and newly added claims, and features of claims 18 and 20, the references are even more far afield. For example the time

period set forth in claims 3, 18, 20, and 27 is not fairly suggested by the '695 reference, in combination with the other claim limitations. The general statement in lines 55 through 59 on page 3 of the '695 reference does not suggest the maximum recited time with the maximum recited temperature, namely 95°C at 120 minutes. Rather the fair implication of the statements there -- especially with the knowledge of one of ordinary skill in the art regarding pulp viscosity reduction as made clear by paragraphs 8 and 9 and the associated tables referenced therein, of the Vuorinen declaration -- is that if one were going to use the non-preferred, maximum, temperature of 95°C one would seek the low time range, such as 1-10 minutes, which is of course clearly outside the scope of these claims. Also since the invention teaches unexpectedly good results (and in fact different results) as a result of the optimization that is provided according to the invention, there could be no proper allegation of obviousness. In re Waymouth, 182 USPQ 290 (CCPA 1974); In re Saether, 181 USPQ 36 (CCPA 1974); In re Antonie, supra.

With respect to claim 7 there clearly and unequivocally is no teaching of the preferred ranges set forth herein, nor of the advantageous results therefrom, as confirmed by the Vuorinen declaration. The temperature set forth in claim 8 is specifically contrary to the references. There is no suggestion in the references of removal of the amount of hexenuronic acid set forth in claim 10, nor of the parameters set forth in claim 11. A pH of about 3-4, as set forth in claim 11 (and also new claims 22-28), is an optimized pH range for the practice of the invention as described in the Vuorinen declaration, but is distinctly higher than the

optimized range in the references, and in fact is specifically contrary to the references.

The kappa number of claim 12 even more clearly distinguishes from Lachenal et al where a high kappa number is necessary. There is no suggestion whatsoever in the references that the pulp should be bleached in a single hydrogen peroxide stage, or that pulp could be produced having a post color number of less than 2, as recited in claim 14. There is not even the most remote suggestion in the references of the possibility of reducing the kappa number in the manner set forth in claim 16 or the production of pulp with a post color number less than 2 as also set forth therein, and again the kappa number set forth in claim 17 is even more far afield from Lachenal et al, making the Lachenal et al teachings even more contrary.

With respect to claim 19 there is no suggestion in the references of any possibility of removing about 90-97% of the hexenuronic acid, and with respect to claim 21 there is no suggestion whatsoever of producing a pulp with a pc number of less than 2. With respect to new claims 22 through 28 the optimized pH range therein is not only not suggested by the references but specifically contrary thereto, and other features of some of these claims are also clearly not present in the applied references.

The invention is a remarkable advance in the art, and recognized as such by those in the art. An illustration of this is provided by the fact that inventor Vuorinen and others have published an article in the TAPPI 1996 International Pulp Bleaching Conference entitled "Subjective Hydrolysis of Hexenuronic Acid

Groups and Its Application in EFC and TCF Bleaching of Kraft Pulps"; a copy of these TAPPI Proceedings article is enclosed. This illustrates the significance of the invention and the interest therein by those in the art.

In conclusion it is clear that all of the claims clearly patentably distinguish from the art and are in proper form, therefore early passage of the subject application to issue is earnestly solicited.

Should any small matters remain outstanding it is requested that the undersigned attorney be given a call so that such matters may be worked out and the application placed in condition for allowance without the necessity of another Action and amendment.

Respectfully submitted,

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